Glossary

A

abiotic factor: a physical, non-living part of the environment

absolute age: the number of years that have elapsed since an event occurred

acceleration: the change in velocity over a specific time interval

acid: a substance that produces hydrogen ions when dissolved in water to form a conducting aqueous solution

activity series: a list of substances in order of reactivity with one another

adaptation: any structural trait or behavioural trait that improves an organism's success at surviving and reproducing in a particular environment

algae: microscopic, photosynthetic organisms that play a vital role in marine and freshwater ecosystems

alkane: a hydrocarbon that contains only carbon-carbon single bonds; C_nH_{2n+2}

alkene: a hydrocarbon that has at least one carbon-carbon double bond; C_nH_{2n}

alkyl group: a branch of a larger molecule consisting of an alkane with one hydrogen removed

alkyne: a hydrocarbon that has at least one carbon-carbon triple bond; C_nH_{2n-2}

amplitude: the maximum displacement of a wave from the rest position

anion: a negatively charged ion

anode: the electrode in a cell where the oxidation half-reaction occurs

applied force: an external force applied on an object

aqueous solution: a solution in which water is the solvent

asexual reproduction: the production of identical offspring from a single parent cell by budding, by the division of a single cell, or by the division of the entire organism into two or more parts

asthenosphere: the uppermost layer of the mantle

atom: the smallest part of an element that has all the properties of that element

atomic mass: the average mass of the atoms of an element including all isotopes

atomic number: the number of protons in the nucleus of an atom

average speed: the distance travelled over a specified time

average velocity: a vector quantity describing the change in position over a specified time

B

battery: a set of voltaic cells joined to produce an electric current

biodiversity: the variety of life in all its forms, including ecosystem diversity, species diversity, and genetic diversity

biogeochemical cycle: a diagram representing the movement of elements and compounds between living and non-living components of an ecosystem

biological community: interacting populations living in a certain area at a certain time

biomass: the dry mass of all the living organisms occupying a habitat

biotic factor: a living organism in the environment

braking distance: the distance a vehicle travels from the moment the brakes are first applied to the time the vehicle stops

branched alkane: an alkane consisting of a long chain with smaller carbon branches attached to it

Burgess Shale: a Cambrian-age rock unit found on the side of Mount Wapta in the Canadian Rockies known for its well-preserved fossils

C

carbon-based compound: a compound primarily made up of carbon atoms

carbon sink: a system that removes more carbon dioxide from the atmosphere than it releases into the atmosphere

carnivore: an organism that kills and eats other animals

carrying capacity: the maximum number of individuals that can be sustained for an indefinite period in a given ecosystem

cathode: the electrode in a cell where the reduction half-reaction occurs

cation: a positively charged ion

cause: a phenomenon that brings about an effect or a result

cell notation: a concise description of a voltaic cell

cellular respiration: the process by which cells convert the chemical energy stored in sugars into energy that the cells can use

Cenozoic Era: the last 65 million years of Earth's history

chemical change: a change in which one or more new substances with different properties is formed

climate: the average daily and seasonal weather events that occur in a region over a long time period

climax community: a stable community that results from the process of succession

closed population: a group of organisms that exists in a natural or artificial setting where immigration and emigration do not occur and numbers are only affected by births and deaths

collision-reaction theory: a theory stating that chemical reactions involve the collision and rearrangement of particles

combustion: a rapid reaction with oxygen that produces energy and oxides

commensalism: a form of symbiosis in which one organism benefits and the other organism is neither helped nor harmed

competition: an interaction in which two or more organisms compete for the same limited resource

complete structural diagram: a diagram of a molecule that uses a short line to show the bonds that exist due to the sharing of a pair of electrons between atoms

compound: a pure substance formed from atoms of two or more elements with the different atoms joined in fixed ratios

concentrated solution: a solution containing a high ratio of solute to solution

concentration: the ratio of the quantity of solute to the quantity of solution

condensed structural diagram: a diagram of a molecule that uses a short line to show carbon-carbon bonds but uses the chemical formula for carbon-hydrogen bonds

consumer: an organism that uses other organisms as a source of energy

continental ice sheet: a very large glacier, often more than 1 km in depth, that forms in polar regions

continuous-chain alkane: an alkane consisting of one simple chain of carbon atoms

conversion factor: a fraction used to convert one set of units into another

cordillera: an extensive chain of mountain ranges that forms the principal range of a continent

core: the innermost layer of Earth consisting of a solid inner core and a liquid outer core

correlation: one phenomenon that accompanies another

corrosion: the oxidation of a metal

covalent bond: a bond formed by the simultaneous attraction of two nuclei for a shared pair of electrons

cracking: a reaction in which hydrocarbons are broken down into smaller molecules by means of heat (thermal cracking) or catalysts (catalytic cracking)

crustal plate: a large piece of continental crust or oceanic crust that floats and slowly moves atop the asthenosphere

cyanobacteria: microscopic, photosynthetic, single-celled bacteria

D

Darwinian fitness: the reproductive success of an organism

Darwinian fitness is not a measure of speed, strength, or health, although these things may influence reproductive success.

deceleration: the slowing down of an object due to the acceleration vector pointing in the opposite direction of the velocity vector

decomposer: an organism that breaks down complex, organic molecules into simpler molecules

deep time: the theory that Earth has a long history of development and change lasting billions of years

denitrification: the process of converting nitrates in the soil into nitrogen gas

denitrifying bacteria: a type of soil bacteria that converts nitrates in soil into nitrogen gas, releasing this gas to the atmosphere

dietary cholesterol: a substance found in food from animal sources

dilute solution: a solution containing a low ratio of solute to solution

dissociation: the separation of an ionic compound into individual ions in a solution

displacement: a vector quantity describing the length and direction in a straight line from the starting position to the final position

doubling time: the amount of time it takes for a population to double its size

drill core: a cylindrical sample of subsurface rock taken during drilling operations and returned to the surface for analysis

E

ecology: the study of the interactions of living organisms with one another and with their physical environment

ecosystem: all the organisms in an area as well as the abiotic factors with which they interact

electrode: a solid electrical conductor in a cell that connects a cell to an external circuit

electrolysis: the decomposition of a substance by means of an electric current

electrolyte: a solute that forms a solution that conducts electricity

electrolytic cell: a chemical system in which non-spontaneous oxidation and reduction reactions are made to occur by the application of electrical energy

electron: a negatively charged particle located in the region surrounding the nucleus of an atom

electroplating: the process of depositing a metal at the cathode of an electrolytic cell

element: a pure substance that cannot be broken down into simpler substances by chemical means

endangered species: a species that may soon no longer exist within certain regions and/or may be threatened with imminent extinction

endothermic change: a chemical change in which energy is absorbed from the surroundings

energy: the ability to do work

energy level: a specific region surrounding the nucleus that is available for electrons

epicentre: the point on Earth's surface directly above the focus of an earthquake

essential fatty acid: a fatty acid that the body cannot synthesize itself and must obtain from food

exothermic change: a chemical change in which energy, usually in the form of heat, is released into the surroundings

exponential curve or **J-curve:** the distinctive shape of the graph for a population that is regularly increasing and growing exponentially

exponential growth: the rapid growth in population caused by a constant increase

F

fatty acid: an organic molecule consisting of a long chain of carbons with a COOH group at one end and a methyl group at the other end

fault: a crack in Earth's crust due to the motion of one tectonic plate relative to another

focus: the region that first breaks along a fault during an earthquake

food chain: a pathway along which food is transferred from one trophic level to the next

food web: the interconnecting feeding relationships within an ecosystem

force of friction: a contact force between two surfaces that acts to oppose the motion of one surface past the other

fossil: the evidence or remains of ancient life preserved in Earth's crust

fossilization: the process by which any trace of the existence of ancient life is preserved within rock

fossil record: the record of all life on Earth as preserved by all fossils that exist, whether dug up or still in the ground

fraction: a group of compounds found in petroleum with similar properties and uses

fractional distillation: a process used for the separation of a liquid mixture by vaporizing it and collecting the different components of the mixture as they cool down and condense at their appropriate boiling points

G

gene: the basic unit of inheritance passed down from parent to offspring

generation: a single step in the line of descent—grandmother, mother, and daughter represent three generations

Geological Time Scale: a generalized, chronological time scale of Earth's history based upon an idealized stratigraphic column containing specific rock types and fossils

glaciation: a period during which polar ice sheets advance to cover large regions of North America and northern Europe

glacier: a large river of ice that forms on land and moves under the influence of gravity

global conveyor: the system of ocean currents that circulates warm water away from the tropics near the ocean's surface

The system also recirculates the cold water of the polar regions using currents that flow in the opposite direction in the deep ocean.

gradualism: the theory that changes to the organisms in a population occur slowly and steadily over Earth's history

gravitational potential energy: energy due to the position of an object above Earth's surface

H

habitat: all biotic and abiotic factors present in an area that encourage the reproduction and survival of a particular organism

habitat destruction: the permanent alteration of vital characteristics in an organism's habitat

habitat fragmentation: the conversion of formerly continuous habitat into patches separated by non-habitat areas

half-life: the time taken for half of a radioactive sample to decay

A half-life is a constant increment of time that depends on the particular isotope.

harmful algal bloom: a rapid growth of algae that can deplete the oxygen dissolved in the water and block the sunlight required by other organisms in the aquatic ecosystem

head-to-tail method: a method where the tail of a succeeding vector arrow begins at the head of the preceding vector arrow

herbivore or **primary consumer:** an organism that eats green plants, algae, or phytoplanktons

humidity: the atmosphere's moisture content

humus: the organic component of soil created from the decomposed bodies of organisms

hydrocarbon: an organic molecule containing only carbon and hydrogen atoms

hydrogenation: a reaction that converts carbon-carbon double and triple bonds in unsaturated compounds into carbon-carbon single bonds of saturated compounds

hydrosphere: all the water at or near Earth's surface

I

ice age: a period during which ice sheets cover parts of the Northern and Southern Hemispheres

igneous rock: a rock formed at very high temperatures from molten material called magma

impulse: the product of the net force applied to an object and the time interval during which the force acts

index fossil: a fossil used to determine the relative age of a layer in a stratigraphic sequence or to match stratigraphic sequences from different locations

industrially produced trans fat: a fat molecule produced by partial hydrogenation that contains at least one trans fatty acid chain

industrially produced trans fatty acid: a synthetic molecule that has the hydrogen atoms on either side of the double bond, resulting in a straighter carbon chain

inertia: the property of an object to resist changes in its state of motion

instantaneous speed: speed at an instant of time

intrusion: a body of rock that forms from the invasion of magma into a pre-existing rock formation

invasive species: a species that does not normally occur in an area that is introduced by human action

The invasive species then expands to become a breeding population, which becomes a threat to the area's biodiversity.

ion: an electrically charged atom or group of atoms

ionic bond: a bond formed by the simultaneous attraction between positive and negative ions

ionic compound: a pure substance formed from a metal and a non-metal

isotope: a particular variety of an element as defined by its atomic mass

J

J-curve or **exponential curve:** the distinctive shape of the graph for a population that is regularly increasing and growing exponentially

K

kinetic energy: energy due to the motion of an object

L

law of conservation of energy: a law stating that when energy changes from one form to another, the total energy of the system remains constant

law of conservation of momentum: a law stating that if the net force acting on a system is zero, the sum of the momentum before an interaction equals the sum of the momentum after the interaction

law of superposition: a law stating that higher strata in a sequence of rock layers are younger than lower strata

Lewis dot diagram: a representation of an atom that shows only the valence electrons

lichen: an organism formed by the symbiotic association of a fungus and a photosynthetic alga

line structural diagram: a diagram of a molecule that only uses a short line to show the bonds between carbon atoms

lithosphere: Earth's outermost rigid layer of rock

longitudinal wave: a wave in which the vibration of the particles is parallel to the direction the wave is travelling

M

magnitude: the size of a measurement with some unit

mantle: the layer of Earth between the crust and the core

mass: the quantity of matter in an object

mass number: the total number of protons and neutrons in an atom

mesosphere: the part of the mantle beneath the asthenosphere

metamorphic rock: a rock changed from its original form and/or composition by some combination of heat, pressure, or chemically active fluids

metal: a malleable and ductile element that has lustre, has good heat and electrical conductivity, and tends to form positive ions

molar concentration (molarity): the amount of solute, in moles, per litre of solution

molar mass: the mass of 1 mol of a substance

mole: a specific amount of a substance that consists of 6.022×10^{23} particles

molecular compound: a pure substance formed from non-metals

molecule: a particle containing a fixed number of covalently bonded, non-metal atoms

mole ratio: the ratio of the coefficients in a balanced chemical equation

momentum: the product of an object's mass and its velocity

monounsaturated fat: a fat molecule that includes fatty acids having only one double bond

morphology: the detailed shape and form of an animal

mountain glacier: a glacier that forms in mountainous regions at high elevations

mutation: a change in a genetic instruction

mutualism: a symbiotic relationship in which the organisms of both species benefit

N

net force: the vector sum of all forces acting on an object

In this context, the word *net* means "sum" or "total."

neutron: a neutral particle located in the nucleus of an atom

Newton's first law of motion: a law stating that in the absence of a net force, an object in motion will tend to maintain its velocity and an object at rest will tend to remain at rest

Newton's second law of motion: a law stating that an object will accelerate in the direction of the net force

$$\vec{a} = \frac{\vec{F}_{\text{net}}}{m}$$

Newton's third law of motion: a law stating that whenever one object exerts a force on a second object, the second object exerts an equal but opposite force on the first object

nitrification: the process of converting ammonia into nitrates or nitrites

nitrifying bacteria: a type of soil bacteria that converts ammonia into nitrates and nitrites

nitrogen fixation: the process of converting nitrogen gas into ammonia

non-electrolyte: a solute in a solution that does not conduct an electric current

non-metal: an element that is not flexible, does not conduct electricity, and tends to form negative ions

non-spontaneous reaction: a chemical reaction that does not occur without the addition of external energy

non-uniform motion: motion with a change in speed, direction, or both

nutrient: an element or compound an organism needs for metabolism, growth, or other functions

O

omnivores: an organism that eats both plants and animals

open population: a group of organisms that exists in a natural setting where births, deaths, immigration, and emigration all affect the population numbers

ore: a rock that contains a useful metal in a sufficient concentration that makes it economical to mine

organic chemistry: the study of compounds composed of carbon

outcrop: a part of a rock formation that appears above the surface of the surrounding land

oxidation: a chemical process involving the loss of electrons

oxidizing agent: a substance that makes the oxidation process possible by gaining electrons

ozone: a molecule comprised of three atoms of oxygen, O_3

P

paleomagnetism: the study of the magnetic properties of rock formed in a past geological era

Pangaea: a single supercontinent that formed in the late Paleozoic Era

parasitism: a symbiotic relationship in which one organism, called the parasite, benefits at the expense of another organism, called the host

peat: deep layers of mosses and plant remains unable to completely decompose due to the lack of oxygen in water-saturated soil

petrochemical: a chemical made from petroleum

petroleum: liquid hydrocarbons formed over millions of years from the remains of ancient microscopic marine organisms

petroleum trap: a large quantity of petroleum confined between layers of impermeable rock

photosynthesis: the process by which plants and some other organisms use light energy to convert water and carbon dioxide into oxygen and high-energy carbohydrates, such as sugars and starches

pioneer species: simple and hardy plants that first invade or colonize barren ground and change the environment to support more complex life forms

plastic: a substance with the properties of a solid that can flow under pressure

plate tectonics: a theory stating that the lithosphere consists of crustal plates that slowly move across Earth's mantle and interact at their boundaries

polar molecule: a molecule with a partial positive charge at one end and a partial negative charge at the other end

polymer: a large hydrocarbon molecule formed by a polymerization reaction

polymerization: a reaction where many short hydrocarbon molecules join together to form very long hydrocarbon chains

polyunsaturated fat: a fat molecule that includes fatty acids having more than one double bond

population: a group of organisms, all of the same species, that interbreed and live in the same area at the same time

position: a vector quantity describing the location of a point relative to a reference point

Precambrian Era: the first major section of geological time, lasting from the origin of Earth 4.5 billion years ago up to 590 million years ago

predation: an interaction where one organism, the predator, kills and eats another organism, called the prey

prefix: the first syllable in the name of an organic molecule that indicates the number of carbon atoms in the molecule

primary consumer or **herbivore:** an organism that eats green plants, algae, or phytoplanktons

primary succession: the process of changing, in successive stages, an environment from an area of bare rock and few species into a complex community

primary wave or P-wave: a seismic wave that travels through rock as a series of compressions and expansions of particles

A P-wave is able to pass through solids, liquids, and gases.

probability: a measure of how likely it is that an event will occur

producer: an organism that uses light energy to synthesize sugars and other organic compounds through the process of photosynthesis

proton: a positively charged particle located in the nucleus of an atom

punctuated equilibrium: the theory that changes to the organisms in a population can occur in rapid spurts followed by long periods of little change

Q

qualitative property of a solution: a basic attribute of a solution you can observe with one or more of the five senses

R

radioactive decay: the disintegration of an unstable atom that results in the release of energy in the form of radiation

radioactivity: the emission of energy from the nuclei of unstable atoms as they change to become more stable atoms

reaction distance: the distance a vehicle travels while the driver is reacting

reef: a submerged ridge of rock, sand, or coral that rises to the water's surface

redox reaction: reduction-oxidation reaction

reducing agent: a substance that makes the reduction process possible by losing electrons

reduction: a chemical process involving a gain of electrons

refining: an industrial process that separates, purifies, and alters raw materials

relative dating: the process of placing rocks and geological structures in the correct chronological order

resultant displacement: the vector sum of individual displacements

Richter magnitude: a number assigned to an earthquake based upon the amount of vertical ground motion at its epicentre

rock cycle: a concept that relates the continual change of rocks from one type to another

S

saturated hydrocarbon: a hydrocarbon containing only single covalent bonds between carbon atoms

scalar quantity: a quantity consisting of magnitude only, not direction

scavenger: a bird or animal that feeds on dead and decaying animals that it did not kill itself

S-curve: the distinctive shape of the graph for a population limited by factors such as disease, competition, and famine

secondary consumer: an organism that eats herbivores

secondary succession: the return in stages to a stable climax community from an area that has had its vegetation, but not its soil, removed

secondary wave or S-wave: a seismic wave that travels through rock as a series of crests and troughs

An S-wave can pass through solids but not liquids or gases.

sedimentary rock: rock formed from compressed layers of pre-existing rock or organic matter

seismic wave: a wave that travels through Earth as a result of explosions or earthquakes

seismogram: a record of seismic waves provided by a seismograph

seismograph: an instrument that records seismic waves

sign convention: an agreement about which direction is positive and which is negative

single replacement reaction: a reaction in which an element reacts with a compound to produce a new element and a new compound

solute: a substance in a solution whose bonds are broken by a solvent; a substance that dissolves

solution: a homogeneous mixture of dissolved substances that contains a solute and a solvent

solvent: a substance in the solution that breaks down the bonds of a solute; a substance that does the dissolving and is in greater proportion in the mixture

spectator: an atom or polyatomic ion that does not change in a chemical reaction

spontaneous reaction: a chemical reaction that occurs without the addition of external energy

standard solution: a solution having a precisely known concentration

strata: the layered bands within sedimentary rock

stratigraphic sequence: a sequence of rocks that provides a chronological record of a region's geological history

stromatolite: a layered structure built by cyanobacteria

subduction: the downturning of oceanic crust under another crustal plate

suffix: the second syllable in the name of an organic molecule that indicates the family of the organic molecule

sustainable development: development that meets the needs of the present without compromising the needs of future generations

symbiosis: a long-lasting, ecological relationship that benefits at least one organism of two different species that live in close contact

T

terraforming: the process of transforming a planet to be more Earth-like

tertiary consumer: an organism that eats secondary consumers

theory of evolution: a theory stating that the nature of a population gradually changes form over time

theory of natural selection: a theory stating that evolution takes place because more organisms are produced than can survive and only the organisms best suited to their environment survive to reproduce and, in turn, pass on their advantageous traits to their offspring

trace fossil: indirect fossilized evidence left by ancient organisms rather than the organisms themselves

transect: a straight line perpendicular to the base line along which ecological measurements are taken

transpiration: the loss of water vapour from a plant through its leaves

transverse wave: a wave in which the vibration of the particles is perpendicular to the direction the wave is travelling

trophic level: the division of species within an ecosystem based upon its energy source

tsunami: a seismic sea wave set off by an earthquake in or near an ocean basin

U

unconformity: a surface in a rock sequence that represents a break in the pattern due to erosion or a lack of deposition

uniform acceleration: acceleration described by a sloping, straight line on a velocity–time graph

uniformitarianism: the principle that the geological processes in action today have always fundamentally operated in the same way throughout Earth's history

uniform motion: motion in a straight line at a constant speed

unsaturated hydrocarbons: a hydrocarbon containing double or triple covalent bonds between carbon atoms

V

valence electron: an electron that occupies the outermost energy level in an atom

variation: a difference in the frequency of genes and traits among individual organisms within a population

vector: a quantity consisting of magnitude and direction

voltaic cell: a device that spontaneously produces electricity by redox reactions

W

weather: the state of the atmosphere in terms of variables such as temperature, cloud cover, precipitation, and humidity for a particular place at a particular time

work: the transfer of energy from one object or system to another when a force is applied over a distance

X

Y

Z